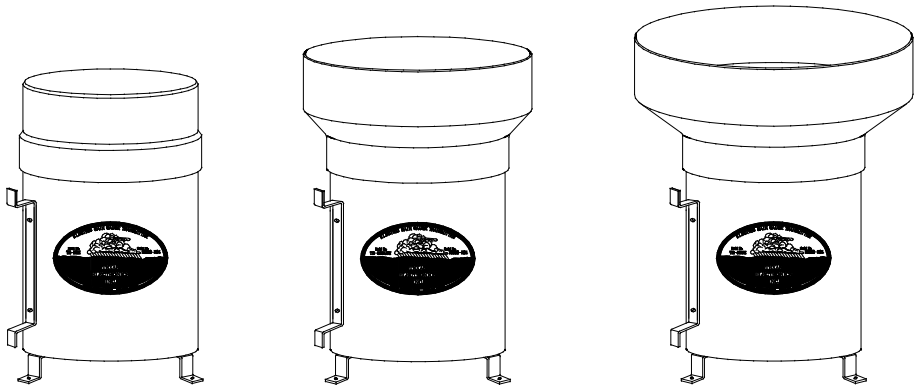
Complete Weather Station
User's Manual

Texas Electronics, Inc.
5529 Redfield Street
Dallas, TX 75235
Tel.214.631.2490
Fax.214.631.4218
www.texaselectronics.com



Model TR-525 Rainfall Sensors

DESCRIPTION

The sensor consists of a gold anodized aluminum collector funnel with a knife-edge that diverts the water to a tipping bucket mechanism. The models TR-525I and TR-525USW are calibrated in inches (.01" per tip) and model TR-525M is calibrated in millimeters (.1mm per tip). A magnet is attached to the tipping bucket, which, as the bucket tips, actuates a magnetic switch. Thus, a momentary switch closure takes place with each tip of the bucket. Connecting the sensor to an event counter on an electronic datalogger or display module will allow record keeping of accumulated rainfall. If an analog signal representing rainfall accumulation is required, Texas Electronics, Inc. manufactures a suitable conditioning circuit.

The spent water drains out of the bottom of the housing; hence, the sensor requires no attention or servicing of any sort. It is completely automatic. The aluminum sensor housing is finished with a white baked enamel paint to withstand years of exposure to the environment.

SPECIFICATIONS

Resolution:	0.01" or 0.1 mm
Accuracy:	
English	1.0% at 1"/hr or less
Metric	1.0% at 10 mm/hr or less
Average Switch Closure Time:	135 ms
Maximum Bounce Settling Time:	0.75 ms
Maximum Switch Rating:	30 VDC @ 2 A, 115 VAC @ 1 A
Temperature Limits:	+32°F to +125°F
Humidity Limits:	0 to 100%
Height:	10.125"
Weight:	2.5 pounds
Receiving Orifice Diameter:	6.060" (English)
	9.664" (Metric)
	8.000" USW (English)
Cable:	25', 24 Gauge 2 conductor
Installation:	Consists of attaching the three sensor support legs to a firm platform or securing the side bracket to a stable vertical structure such as the lower end of weather station mast. Sensor cable is then connected to monitoring equipment.
Maintenance:	Occasional cleaning of debris from filter screen may be required.
Warranty:	3 years

ORDERING INFORMATION

Model #	Description
TR-525I	Rain Gauge, 6.06” collector, English (Please specify for calibration of 0.2 mm/tip)
TR-525USW	Rain Gauge, 8.00” collector, English
TR-525M	Rain Gauge, 25 mm collector, Metric

Optional Parts / Accessories

HOBO	Event Datalogger and Software
MB-525	Pole Mounting Base
FC-525	Field Calibration Kit
BB-525	Bird Repellant
HT-525	Heater, 120 VAC
Cable	Additional Cable

MODEL 525

TIPPING BUCKET RAIN GAUGE TRANSMITTER

INSTALLATION INSTRUCTIONS

A clear and unobstructed mounting location is necessary to obtain accurate rainfall readings.

This transmitter has provisions for mounting two ways, surface mounting and mast mounting. Surface mounting is recommended where possible. The transmitter housing MUST be mounted in a LEVEL position and in a location free from vibration. If mast mounted, make sure that the mast is properly guyed so that vibration in high winds is kept to a minimum.

THE FOLLOWING IS VERY IMPORTANT:

After the final transmitter installation has been made, remove the top gold funnel portion of the transmitter and observe the black tipping bucket. It should NOT (repeat NOT) be held in a dead center position by the magnetic attraction of the bucket magnet and the hermetically sealed magnetic switch. Press either end of the bucket down against the stop to be sure that it is not centered.

The transmitter to indicator connecting cable may be either shortened or lengthened as required.

The funnel and tipping bucket mechanism should be cleaned periodically. An accumulation of dirt, bugs, etc. on the tipping bucket will adversely affect the calibration.

FIELD CALIBRATION

TR-525USW

Absolutely accurate calibration can be obtained only with laboratory equipment, but an approximate field check can be easily made. The tipping bucket mechanism is a simple and highly reliable device. The transmitter must be located in a clear area, away from trees, buildings, etc. It must also be mounted level. Accurate readings will not be obtained unless the transmitter is mounted in a level position. The mechanism must be clean. Any accumulation of foreign material, dust, etc. will alter the calibration of this unit. The transmitter must be calibrated with the rate of flow of water through the tipping bucket mechanism under control. At least 36 seconds should be allowed to fill one side of the tipping bucket. This represents a maximum flow rate of on inch of rain per hour. If the flow rate is increased, then the instrument will read low (if properly calibrated). Decreasing the rate of flow will not materially affect the calibration. The reason for this is obvious if the tipping bucket assembly is observed when the weight if this water starts to tip the bucket. Some time is required for the bucket to tip (a few milliseconds). During the first 50% of this time, water flows into the empty bucket. The amount of water flowing during the first 50% of the time is error, the faster the flow rate, the greater the error. Now at flow rates of one inch per hour (100 bucket fillings) or less, the water actually drips into the bucket rather than flowing. Under this condition, the bucket tips between drips, and no error water is added to a full moving bucket.

TO CHECK CALIBRATION:

A field calibration kit is available from Texas Electronics, Inc. Model No. FC-525 is a kit that consists of a holding tank, pre-measured beaker, two orifices, cleaning tools and instructions.

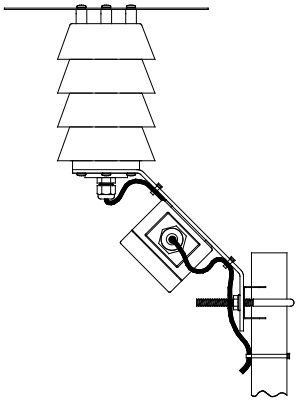
FIELD CALIBRATION

TR-525I & TR-525M

Absolutely accurate calibration can be obtained only with laboratory equipment, but an approximate field check can be easily made. The tipping bucket mechanism is a simple and highly reliable device. The transmitter must be located in a clear area, away from trees, buildings, etc. It must also be mounted level. Accurate readings will not be obtained unless the transmitter is mounted in a level position. The mechanism must be clean. Any accumulation of foreign material, dust, etc. will alter the calibration of this unit. The transmitter must be calibrated with the rate of flow of water through the tipping bucket mechanism under control. At least 36 seconds should be allowed to fill one side of the tipping bucket. This represents a maximum flow rate of on inch of rain per hour. If the flow rate is increased, then the instrument will read low (if properly calibrated). Decreasing the rate of flow will not materially affect the calibration. The reason for this is obvious if the tipping bucket assembly is observed in operation…with water falling into one side of the tipping bucket, there comes a point when the weight of this water starts to tip the bucket. Some time is required for the bucket to tip (a few milliseconds). During the first 50% of this tipping time, water continues to flow into the filled bucket; the last 50% of this tipping time, water flows into the empty bucket. The amount of water flowing during the first 50% of the time is error, the faster the flow rate the greater the error. Now at flow rates of one inch per hour (100 bucket fillings) or less, the water actually drips into the bucket rather than flowing. Under this condition, the bucket tips between drips, and no error water is added to a full moving bucket.

TO CHECK CALIBRATION:

A field calibration kit is available from Texas Electronics, Inc. Model No. FC-525 is a kit that consists of a holding tank, pre-measured beaker, two orifices, cleaning tools and instructions.



MODEL TTH-1315 TEMPERATURE HUMIDITY SENSOR

DESCRIPTION:

The Texas Electronics, Inc. Model TTH-1315 Sensor utilized a Rotronics HygroClip S3 Humidity Temperature Probe with interchangeable sensing elements that do not require calibration.

The unit is encased in a corrosive-resistant spun aluminum radiation shield that allows for wind aspiration and protection from the sun's UV rays. The shield is finished in white baked-enamel to provide for virtual cosmetic invisibility while reflecting much of the radiant heat from surrounding objects and the sun.

Overcurrent protection is provided in a NEMA 4X enclosure that is mounted to the angled mounting bracket on the sensor. Tranzorbs are utilized to protect the sensor and signal conditioning units in an overcurrent situation.
With DC voltage applied to the sensor, the unit will return signal voltages that are linear to the range of the instrument. Signal conditioning is applied to ensure proper voltages are returned and can be amplified or modified to a current output to connect to any analog signal processing unit.

SPECIFICATIONS:

Humidity Sensor:	HydroClip SE
Temperature Sensor:	RTD Pt100 Ohm, 1/3 DIN
Sensor Protection:	Wire Mesh filter (standard) / foam filter (optional)
Measuring Range:	0-100 % Relative Humidity
	-40° to +140°F (-40° to +60°C) Temperature
Operating Limits:	Same as measuring range
Accuracy at	
73°F / 23°C:	+/- 1.5% RH and +/- 0.5°F / 0.3°C - standard calibration
	+/- 1.0% RH and +/- 04°F / 0.2°C - special calibration (optional)
Repeatability:	Better than 0.5% RH and 0.1°C/ 32.18°F
Analog output signals:	0 - 100% RH = 0 - 1V
	(minimum load >10k ohm)-40+140°F = 0 - 1V (-40+60°C)
	Analog Signal Resolution 0.02% RH and 0.1°F

Sampling Time:	<0.7 sec
Maximum cable length:	5 m / 15 ft. for direct output
	Up to 100 m / 325 ft. with signal amplifier
Connection Type:	Bayonet cap on mounting connector
Protection grade:	IP65 (probe to connector)
Supply voltage:	3.5 - 50VDC
Current consumption:	<4 mA
Minimum excitation time:	<4 sec
EMC compatibility (CE):	EN-50081-2, EN-50082-2
Material:	Powder-coat, white
Dimensions:	Length: 100 mm (3.94")
	Diameter: 15 mm (0.59")
Weight:	14 g / 0.5 oz.

FEATURES & BENEFITS

- Combines Temperature and Humidity onto one sensing unit
- Rotronics HygroClip S3 has interchangeable sensing elements requiring no calibration
- Stacked plate construction of shelter provides natural ventilation
- Quick-Release mounting bracket allows for easy installation and maintenance
- Aluminum radiation shield is lightweight and extremely durable
- White powder-coat finish reflects most radiant heat from sun and surrounding objects

INSTALLATION & MAINTENANCE

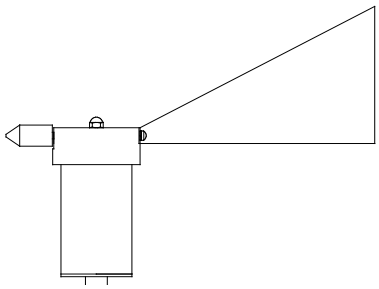
The radiation shield with sensing element can be pole or mast mounted. Whenever possible, sensors should be installed at a height of 4 ft. (1.2 meters) or greater over earth or sod at least 100 ft. (30.48 meters) away from any concrete or other hard-surfaced area and not closer to any other object than four times the height of the object above the instrument shelter or remote sensors. Avoid roof installations if possible. If it is necessary to roof-mount shelters and sensors, they should not be closer than 30 ft. (9.14 meters) to any large, vertical reflecting surface (walls, etc.), exhaust fans, or cooling towers. Electronic remote sensors when roof-mounted should be at least 9 ft. (2.74 meters) or greater above the roof surface. To minimize radiation effects from the roof, they can also be mounted on a horizontal boom so that they will extend from the side of the building roof or tower assembly.

ORDERING INFORMATION

Model #	Description
TTH-1315	Temperature & Humidity Sensor
TTH-1315-A	Temperature & Humidity Sensor, 4-20 Ma

Optional Parts / Accessories

H50	Interior Humidity Sensing element only
Cable	Additional Cable



MODEL TD-4 WIND DIRECTION SENSOR

DESCRIPTION:

The Texas Electronics, Inc. TD-4 Wind Direction Sensor is a mechanical style wind meter that measures the horizontal wind azimuth. This unit combines small physical size with superior bearings to meet the EPA's Prevention of Significant Deterioration (PSD) starting threshold requirements.
The TD-4 wind direction sensor is a freestanding device for measuring the direction of wind. The sensor consists of a vane and counterweight assembly, which is mechanically coupled to a potentiometer (variable resistor). As the vane rotates in the wind, the potentiometer changes resistance proportionally to the direction of wind.

SPECIFICATIONS:

Operating Range:	0-360° mechanical
Signal Presentation:	5000 ohm potentiometer, 10000 ohm potentiometer, or Analog 4-20 mA
5000 ohm output:	0-355° electrical range 3 VDC excitation minimum
10000 ohm output:	0-357° electrical range 3 VDC excitation minimum
Analog 4-20 mA output:	0-355° electrical range 10-30 VDC
Performance:	
Accuracy:	+/- 3.0°
Starting Threshold:	0.6 mph (0.27 m/s)
Resolution:	1°
Potentiometer Linearity:	+/- 1.0%
Environmental:	
Operational Envelope:	0-135 mph (0 to 60 m/s)
Temperature:	-40 to 160° F (-40 to 70° C)
Relative Humidity:	0-100%
Physical:	
Vane Overall Length:	8.5" (21.6 cm)
Overall Height:	6.75" (17.2 cm)
Turning Radius:	13" (33 cm)
Weight:	0.5 lbs (0.23 kg) less cable
Bearings:	APEC 3 or better
Mounting Base:	Screw attachment, 10-32 machine screw
Cable:	60', 22 Gauge 3 conductor

FEATURES & BENEFITS

- Superior low starting threshold
- Long life hybrid dual wiper potentiometer
- No plastic parts for extremely long life
- Precision stainless steel bearings for stability and repeatability
- Crossarm included with purchase of matching wind speed sensor
- Easy installation and maintenance
- Over 25 years in production
- Lightweight and rugged anodized aluminum exterior

INSTALLATION & MAINTENANCE

Installation consists of threading the 10-32 mounting base into our crossarm or any other suitable beam. If a crossarm is used, the entire unit can be bolted to a mast or attached via U-bolts.

The sensor is dynamically calibrated at the factory and due to the nature of its operation should not require field calibration. Calibration is a matter of proper orientation during installation. A magnetic compass is recommended for proper orientation. Field maintenance should include occasional cleaning of the vane assembly and inspection of the internal mechanism to make sure it is free from insects and debris. In some applications users may need to occasionally verify and document sensor accuracy with a calibration dial/vane. Possible bearing and potentiometer replacement every three to five years to maintain low starting threshold.

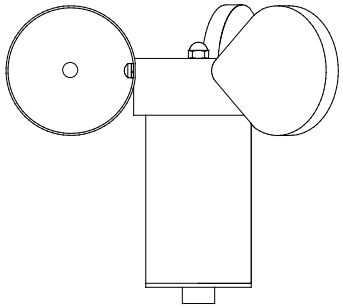
ORDERING INFORMATION

Model #	Description
TD-4	Wind Direction Sensor, Light Industrial
TD-4-A	Wind Direction Sensor, Light, 4-20 mA

* Sensor is designed to work with TV-4 series wind speed sensors.

Optional Parts / Accessories

Cable	Additional Cable



MODEL TV-4 WIND SPEED SENSOR

DESCRIPTION:

The Texas Electronics, Inc. TV-4 Wind Speed Sensor is a mechanical style anemometer that measures the horizontal velocity of wind. This unit combines small physical size with superior bearings to meet the EPA's Prevention of Significant Deterioration (PSD) starting threshold requirements.
The TV-4 wind speed sensor is a freestanding device for measuring air velocity. The sensor consists of a lightweight 3-cup anemometer, which electromechanically converts wind speed into a measurable electronic signal.

The output signal can be presented in 3 optional forms: a pulsed DC signal, an AC frequency, or a conditioned analog signal. Each output has a specific application. The pulsed DC signal is used where high-accuracy is needed and continuous power is not a problem. The AC frequency output is used in situations where power consumption is critical. And finally, the conditioned analog signal is used to easily and quickly communicate with virtually all digital control systems such as PLC's or SCADA systems.

SPECIFICATIONS

Operating Range:	0-100 mph		
Signal Presentation:	Pulsed DC output - light chopper		
	AC Frequency, or Analog, 4-20 mA		
	(Please specify)		
Pulsed DC output:	20-slot disc		
	1 MPH = 520 pulses/min.		
	100 MPH = 52000 pulses/min.	Input Power:	+5.0 VDC @ 5mA (typical)
	(Other voltages available upon request)		
AC Frequency output:	26 mV/MPH (typical)		
	0.133 Hz/MPH	Input Power:	None (self-generating)
	Analog 4-20 mA out: 4 mA = 0 MPH		
	20 mA = 100 MPH	Input Power:	10-36 VDC

Performance:	
Accuracy:	+/- 2.0 mph (0.89 m/s)
Distance Constant:	> 21.7' (6.6 m)
Starting Threshold:	0.6 mph (0.27 m/s)

Environmental:	
Operational Envelope:	0-135 mph (0 to 60 m/s)
Temperature:	-40 to 160° F (-40 to 70° C)
Relative Humidity:	0-100%

Physical:	
Cup Wheel Diameter:	6.0" (15.3 cm)
Overall Height:	4.75" (12.1 cm)
Turning Radius:	3.0" (7.6 cm)
Cup Diameter:	2.0" (5.1 cm)
Bearings:	APEC 3 or better
Mounting Base:	Screw attachment, 10-32 machine screw
Weight:	0.5 lbs (0.23 kg) less cable
Cable:	60', 22 gauge 3 conductor
Warranty:	3 years

FEATURES & BENEFITS

- Superior low starting threshold due to small physical size
- No plastic parts for extremely long life
- Precision stainless steel bearings for stability and repeatability
- Crossarm included with purchase of matching wind direction sensor
- Easy installation and maintenance
- Over 5 years in production
- Lightweight and rugged anodized aluminum exterior

INSTALLATION & MAINTENANCE

Installation consists of threading the 10-32 mounting base into our crossarm or any other suitable beam. If a crossarm is used, the entire unit can be bolted to a mast or attached via U-bolts.

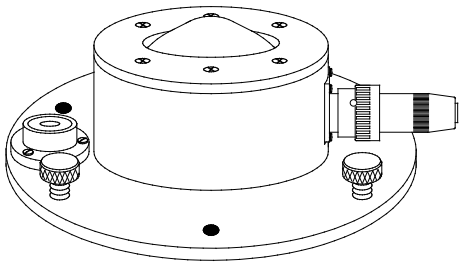
The sensor is dynamically calibrated at the factory and due to the nature of its operation should not require field calibration. Field maintenance should include occasional cleaning of the cup assembly and inspection of the internal mechanism to make sure it is free from insects and debris. In some applications users may need to occasionally verify and document sensor accuracy with a synchronous test motor. Other possible routine maintenance is to replace the bearing housing assembly every three to five years to maintain low starting threshold.

ORDERING INFORMATION

Model #	Description
TV-4	Wind Speed Sensor, Light Industrial (Specify supply voltages other than 5 VDC)
TV-4AC	Wind Speed Sensor, AC Generator
TV-4A	Wind Speed Sensor, Analog 4-20 mA

*Sensor is designed to work with TD-4 wind direction sensor.
Optional Parts / Accessories

Cable	Additional Cable



MODEL SP-LITE SOLAR RADIATION SENSOR

DESCRIPTION

The Texas Electronics, Inc. SP-Lite Solar Radiation Sensor utilizes a Kipp & Zonen Silicon pyranometer mounted in a white powder-coat finished aluminum bracket that provides a stable upward-facing installation. It measures the solar energy that is received from the entire hemisphere (180 degrees field of view). The output is expressed in Watts per square meter.

The pyranometer is designed for continuous outdoor use. Its calibration is valid for natural sunlight only, but not for artificial light. In its most frequent application, the pyranometer is used for measuring the solar radiation emitting on the horizontal surface.

The sensor consists of a photodiode; housing, mounting bracket with cable junction box attached, and cable. A resistance shunts the photodiode. This is done to generate a voltage output. The photodiode and the material on top of it determine most electrical specifications. It is encapsulated in the housing in such a way that it has a field of view of 180 degrees and that its angular characteristics fulfill the "Cosine Response".
The nominal output resistance of the pyranometer is 50 Watts. This implies that the input impedance of the readout equipment should be at least 5000 Ohms in order to make an error of less than 0.1%.
Cable can be extended without problems to a length of 328 ft. or 100 meters, provided that cable resistance is less than 0.1% of the input impedance of the readout equipment.

The electrical sensitivity of the photodiode changes with the temperature. A nominal value for this is 0.2% change per degree Celsius. Calibration is done at 20°C (68°F).

SPECIFICATIONS

Electrical:	Impedance (nominal): 50 Ohms
	Response time: < 1 sec.
	Sensitivity (nominal): 100 uV/W/m2
	Expected signal range under atmospheric conditions: 0 to 0.2V
	Stability: <+/- 2% per year
	Non-linearity: < 1% up to 1000 W/m2
	Temperature dependence of sensitivity: +/- 0.15%/°C
Spectral:	Spectral range: 0.4 to 1.1 nm
	Detector type: SILICON photo diode
Directional:	Cosine corrected between 80° angle of incidence, error: within +/- 10%
	Cosine errors averaged over opposite azimuth error (at 60° angle of incidence): within +/- 10%
	Tilt response: no error

Mechanical:	Material of housing: Anodized aluminum contained in white powder-coat finished aluminum mounting bracket
	Dimensions: Height from surface to top of level Pyranometer - 6.25"(15.87cm)
	Width - 2.75" (6.98 cm)
	Length - 8.25" (20.95 cm)
	Weight: 3 lbs. (1.36 kg.) with 60 ft. cable
Environmental:	Working temperature range - -30° to +70°C (-22° to +158°F)
Cable:	60', 24 Gauge 2 conductor
Warranty:	3 years

FEATURES & BENEFITS

- SP-Lite is an all-weather instrument
- Designed for continuous outdoor use
- Complies with "Cosine Response"
- Full 180-degree field of view for complete hemispheric measurement
- Contained in lightweight and rugged white powder-coat finished aluminum mounting bracket

INSTALLATION & MAINTENANCE

Installation:
The site for an upward-facing pyranometer should be free from any significant obstructions above the plane of the sensing element and should be readily accessible. If practicable, instrument should be located so that (1.) a shadow will not be cast on it at any time (e.g. by radio masts, etc.); (2.) it is not close to light-colored walls or other objects likely to reflect sunlight onto it; and (3.) it is not exposed to artificial radiation sources. A flat roof provides the best location, or a rigid stand with a horizontal upper surface some distance from building structures or other obstructions. The stand should be sufficiently rigid that the horizontal position of the receiving surface does not change, especially during high winds. Precautions should be taken to avoid subjecting the instrument to severe shocks or vibration.

Calibration / Cleaning Frequency:
Recalibration is suggested every two years, preferably by letting a higher standard run parallel during two sunny days and comparing daily totals.

The sensor should be kept clean, using water or alcohol.

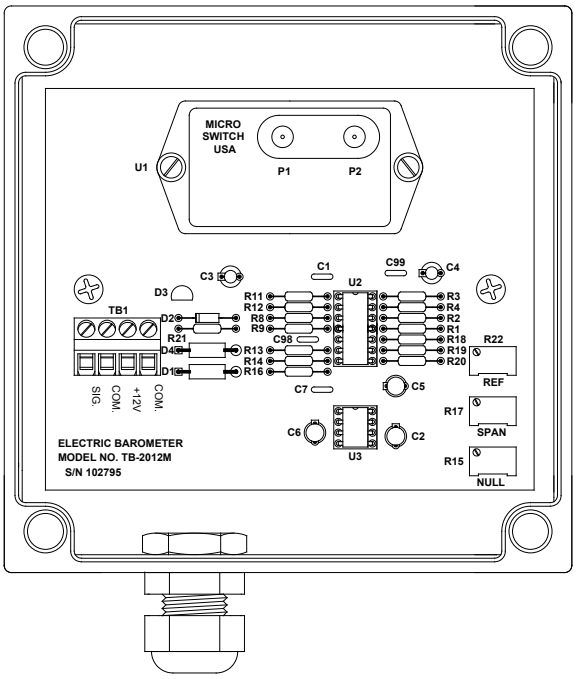
ORDERING INFORMATION

Model #	Description
SP-Lite	Solar Radiation Sensor
SP-Lite-A	Solar Radiation Sensor, 4-20 mA

Optional Parts / Accessories

Cable	Additional Cable available upon request

Texas Electronics, Inc.
5529 Redfield St.
Dallas, Tx 75235
Model TB-2012M Barometer
Remove cover of TB-2012M and adjust for local pressure.
Refer to Pressure vs Voltage/Current Table under the Barometer section of the service manual.



MODEL TB-2012M BAROMETRIC PRESSURE SENSOR

(Shown with cover removed)

DESCRIPTION

The Texas Electronics, Inc. TB-2012M Barometric Pressure Sensor uses an active solid-state device to sense barometric pressure. Self-contained electronics provide a regulated voltage to the solid-state sensor and amplification for the signal output. The unit's range of 26" to 32" or 878 mb to 1080 mb of mercury allows it to be used at elevations up to 1800 feet or 548.64 meters above sea level. The unit is temperature compensated from -18° to +50°C. if elevations above 1800 feet or 548.64 meters are required, contact the factory for higher elevation calibration.

SPECIFICATIONS

Calibration Range:	26" to 32" (878 mb to 1080 mb)
Supply Voltage:	12 to 15 VDC
Current Draw:	<15 mA
Accuracy:	+/- 1.3mb
Operating Temperature Range:	-40° to +50°C
Calibrated Temperature Range:	-18° to +50°C
Output:	0-1 VDC
Optional Output:	4-20 mA
Weight:	2 lbs. (.907 kg.) w/ 60’ cable (18.3 m)
Dimensions:	6" H x 5" W x 3" D (15.24 cm x 12.7 cm x 7.62 cm)
	(Single enclosure: double enclosure also available)
Warranty:	3 years

FEATURES & BENEFITS

- Interfaces to virtually all data acquisition systems
- Can be used up to 1800 ft. elevation without factory modification
- Over 1800 ft. elevation applications available
- Easy installation and maintenance
- Over 5 years in production
- Weatherproof Nema Enclosure for superior outdoor protection
- Wide range of 26" to 32" Hg. (878 to 1080 mb)

INSTALLATION & MAINTENANCE

Select a site where the instrument will not be subject to rapid fluctuations of temperature or to jarring and continuous vibration. Avoid exposing the instrument to direct sunlight or radiant heaters and to direct drafts such as open windows and doors. A mounting bracket with hardware is attached to the Nema enclosure of the sensor.

ORDERING INFORMATION

Model #	Description
TB-2012M	Barometric Pressure Sensor
TB-2012M-A	Barometric Pressure Sensor, 4-20 mA

Optional Parts / Accessories

Cable	Additional Cable
High Elevation:	Applications of higher than 1800 ft. or 548.64 meters above sea-level require factory modification.

PROPER EXPOSURE OF METEOROLOGICAL INSTRUMENTS

Generally recognized guidelines follow which depict "ideal" sensor mounting locations. These guidelines or "rules of thumb" are only suggestive in nature in an attempt to aid the user to selecting optimum representative sampling locations for a particular sensor.

Reference was made to US Weather Bureau Installation criteria in preparing this data (See Reference 1).

WIND EQUIPMENT:

So far as available sites permit, wind sensors should be placed above the ground on a freely-exposed tower (20 feet or higher) and over terrain that is relatively level and free from obstructions to wind flow. When a compromise must be made, sensing units should be exposed at least 12 feet above any obstruction within 100 feet and at least as high as any obstruction within 100 to 200 feet of the wind equipment. Support towers or masts should not be of such bulk or shape as to create an appreciable obstruction to wind flow. Avoid sites where local obstructions may create up-or-down drafts, eddy currents or jet-flow effects. When sensors are roof-mounted, they should be installed at least 10 feet (or greater) from the roof surface depending upon the particular installation site. Turbulence and other local effects can be reduced somewhat by mounting sensors on the upwind and of the building (that end of the building exposed to the most common local prevailing winds). Horizontal-mount booms which extend from existing towers should be fabricated so that sensors will extend a distance of 5 to 10 feet from the tower assembly (dependent on tower thickness).

Wind direction sensors are oriented upon installation in reference to either true north or magnetic north. True north is obtained by applying a local magnetic variation correction factor to a magnetic north compass indication (magnetic variation for a particular locality is obtainable from the nearest Weather Bureau Branch Office). Indicator readings for a true north sensor orientation will then be in terms of true geographic compass points. All U.S. Weather Bureau surface wind data used for observational network reporting purposes and general public use is given in reference to this true north format. Indicator readings for a magnetic north sensor orientation will be in terms of actual readings as would be obtained from directly viewing a magnetic compass instrument. Wind direction data at Federal Aviation Agency and other aircraft reporting facilities (for direct control tower-to-pilot utilization) is always made in reference to this magnetic north format.

REMOTE TEMPERATURE/HUMIDITY SENSORS AND INSTRUMENT SHELTERS:

Whenever possible, instrument shelters* as well as remote temperature and/or humidity sensors should be installed at a height of 4 feet (or greater) over earth or sod at least 100 feet from any concrete or other hard-surfaced area and not closer to any other object than four times the height of the object above the instrument shelter or remote sensors. Avoid roof installations if possible. If it is necessary to roof-mount shelters and sensors, they should not be closer than 30 feet to any large, vertical reflecting surface (walls, etc.), exhaust fans, or cooling towers. Electronic remote sensors when roof-mounted should be at least 9 feet (or greater) above the roof surface. To minimize radiation effects from the roof, they can also be mounted on a horizontal boom so that they will extend from the side of a building roof or existing tower. Horizontal booms should extend approximately 5 to 10 feet from the side of the building roof or tower assembly.

PRECIPITATION GAUGES:

Rain gauges should be installed on a level plot of ground, at a distance from any object of at least two and preferably four times the height of the object above the top of the gauge. All types of gauges must be exposed with the rim of the receiver in a horizontal plane and at a level well above the average level of snow surfaces.

* Standard U.S. Weather Bureau cotton-region shelter (Spec. No. 450.0615, Rev. 8/67)

Roof-mounting of rain gauges should be avoided when possible. Air currents at heights other than at ground level have been observed to cause an apparent decrease in rainfall catch commensurate with the increase in mounting height above ground level.

Objects which individually or in small groups constitute a "windbreak" reduce prevailing wind speed in the vicinity of the gauge. This reduction of wind speed will, as a consequence, also reduce possible eddy currents and turbulence around the gauge. The presence of such objects is usually beneficial in providing a more accurate rainfall catch. Ideally, the "wind-break" objects (fences, bushes, etc.) should be generally uniform in height and distance from the gauge. Height above the gauge should not exceed about twice their distance from the gauge.

ANEROID BAROMETERS - SELF-CONTAINED MECHANICAL INSTRUMENTS AND ELEC-TRONIC REMOTE BAROMETRIC PRESSURE SENSORS:

Select a site where the instrument will not be subject to rapid fluctuations of temperature or to jarring and continuous vibration. Avoid exposing the instrument to direct sunlight or radiant heaters and to direct drafts such as open windows and doors.

Reference 1:

U.S. Department of Commerce - National Weather Service Bulletin
LS 5927 Revised, 0-4.12, January, 1963.

SOLAR RADIATION SENSORS:

The Solar Radiation Sensor is normally mounted on a level surface totally remote from trees, poles, or power lines that might cast a shadow on the sensor at any time of the day. However, there may be occasions, because of extreme latitudes, when it is desired to mount the sensor at some angle other than level.

The sensors may also be mounted on a sun tracking mechanism or behind a shadow band if diffuse sky radiation is to be measured.

WIND DIRECTION & SPEED SENSORS

INSTALLATION

These instructions apply to roof-top installation. We advise that you first read over these instructions before beginning assembly as several referenced items are not supplied with your weather equipment (this is because most every installation is unique thus these parts are best obtained by the installer). Reference to the "U-Tube Cross-Bar Installation" figure and ".Sensor Installation" figure may be helpful.

Step 1: Attach the three anemometer cups to the speed sensor head.
Loosen the three set screws on the top of the anemometer (lower unit).
Insert the anemometer cup arms into the holes. Be sure to press the arms all the way in and make sure that the flat areas on the arms face toward the set screws.
Tighten the set screws.

Step 2: Attach wind vane and counter-weight to the direction sensor head.
Loosen the two set screws on the top of the wind vane (upper unit).
Insert the vane and counter-weight into the holes. Be sure to press both parts all the way in and make sure the flat areas on each arm face the set-screws.
Tighten the set screws.

Note: For optimum performance and maximum bearing longevity you may wish to fine-tune the balance of both wind sensors. Place the U-tube flat on a table such that the sensors hang over the edge. Rotate the vane and the cup in 10 degree increments. After positioning the vane and cups verify that there is no movement after releasing your hold (this must be done in a wind-free environment). Balance adjustments are made by loosening the set screw to the lighter cup, counter-weight or fin and shifting it slightly away from the sensor head.

Step 3: Attach cross-bar to U-tube.
Spread end clamps and slide over the U-tube.
Insert cross-bar into the ends of both clamps.
Fasten cross-bar in a level position with screws, nuts and washers.

Step 4: Attach U-bolts to cross-bar and U-tube.
Remove the two nuts and reinforcing plate from both U-bolts (do not remove the toothed bracket).
Insert one U-bolt through the two holes in the cross-bar and the other through the two holes in the bottom of the U-arm (be careful not to damage the wires inside the U-arm).
Replace the tube reinforcing plate on the U-bolt and replace the U-bolt nuts.

Step 5: Slip the U-bolts over the mast and tighten.
Make certain that the anemometer cups do not hit the mast.

Step 6: Attach guy wire clamp just below the U-tube assembly.

Step 7: Attach base mount to the roof or side wall.
Note that the base mount U-bolt will rotate to fit any angle.

Step 8: Install guy wire anchors (not included) or locate secure points for guy wire attachment.

Step 9: Erect mast and install guy wires (not included) and turn-buckles (not-included).

Step 10: Ground the mast to help protect the sensors and structure from lightning hits.
Supplies needed: mast wire clamp, grounding wire, wire supports and grounding rod.

Step 11: Run the sensor wire inside to the console.
Lead in wire is permanently attached to the sensor unit.
Attach to console according to wire color code.
If necessary the cable may be cut down in length or wire may be added with negligible effect on the calibration. If changing cable lengths more than a few hundred feet you may wish contact the factory to determine the severity of the effect on calibration.
Additional cable lengths are available from Texas Electronics if needed.

Step 12: Calibrate the Wind Vane.
Be sure console is operating properly first.
This is normally a two man job with one individual watching the direction indicated by the weather station and the other adjusting the sensor while watching a compass.

Two methods of aligning the vane are available. The first method involves loosening the large set screw at the bottom of the wind direction sensor so that it will rotate on the U-arm. Turn the bottom half of the sensor until the compass readings and the indication match then retighten the set screw. The second method involves rotating the entire mast assembly until proper orientation is achieved; this technique is usually easier because of the heights involved but will usually necessitate repositioning (rotating) of the guy-wire clamp.

If winds are creating rapid fluctuations in the vane making calibration difficult, the vane can be temporarily secured in a fixed position by carefully wedging a thickly folded piece of paper or cardboard into the gap between the upper and lower halves of the direction sensor. An alternative technique is to lap a string over the vane and carefully hold it in position (be careful not to bend the vane when using this approach).

Warranty

Texas Electronics, Inc. (hereafter TEI) warrants the equipment manufactured by it to be free from defects in material and workmanship. Upon return, transportation charges prepaid to TEI, within three (3) years of original shipment of sensors and one (1) year of original shipment of electronics, recorders and indicators, TEI will repair or replace, at its option, any equipment which it determines to contain defective material or workmanship, and will return said equipment to purchaser, F.O.B., TEI. Texas Electronics shall not be obligated however to repair or replace equipment which has been repaired by others, abused, improperly installed, altered or otherwise misused or damaged in any way. TEI will not be responsible for any dismantling, re-assembly, or reinstallation charges.

This warranty is in lieu of all other warranties, expressed or implied. TEI shall not be liable for any special, indirect, incidental or consequential damages claimed in connection with any rescission of this agreement by purchaser.